



# T H R E A T S

*Natural resources in national parks are imperiled by a myriad of threats originating from inside and outside park boundaries. From habitat destruction to air and water pollution, threats are diverse and on the rise. Census projections suggest that pressures on natural resources in parks will increase in the next century, making preservation even harder. The ability of the National Park Service to deal effectively with the wide variety of threats is small in comparison with the needs and represents a dangerous trend for the future. Monitoring of resource conditions is helping and supplies information on the state of park natural resources. This and other scientific information provides the basis for the National Park Service to plan and carry out rational resource management approaches to address even some of the most vexing preservation problems. Meanwhile, threats continue their march.*

## Threats and information

by Jeff Selleck

**T**hreats to natural resources in national parks are as varied as the parks themselves. Real estate development on the boundaries of Saguaro National Park puts human activities right at the park's edge. Visitors trample alpine meadows in Mount Rainier National Park as they fail to heed regulations and informational signs explaining the fragility of tundra vegetation. Air pollution from distant sources wafts across park boundaries reducing visibility and introducing pollution in park ecosystems across the country. Traffic, mining, logging, hazardous materials, grazing, exotic species; the list of threats goes on and on. And because of each threat, natural resources in the national park system are deteriorating. One weapon against these threats is information about them and on the condition of park natural resources.

In a General Accounting Office (GAO) report issued last August (*National Park Service: Activities Within Park Borders Have Caused Damage to Resources* [GAO/RCED-96-202; August 1996]), eight parks surveyed identified a total of 127 internal threats that directly affect park

resources. Most fell into five categories: the impact of private inholdings or commercial development within parks, the impact of nonnative wildlife or plants on native species, the damage caused by illegal activities such as poaching, the routine wear and tear caused by visitation, and the unintended effects of park or agency actions. The majority of these threats have worsened over the past decade and 80% have already caused more than minor damage to park resources.

In a 1994 report (*National Park Service: Activities Outside Park Borders Have Caused Damage to Resources and Will Likely Cause More* [GAO/RCED-94-59; January 1994]), GAO relayed that park managers responsible for 317 units of the national park system identified 632 external threats to park resources. These can be classified in four main areas: urban encroachment, water-quantity and quality issues, air pollution, and human activities. A few of the lost values associated with the threats include diminished scenic views, polluted streams, habitat destruction, and a loss of biodiversity. In many cases the sources of specific threats have not been identified, but many parks have taken initial steps, such as establishing community outreach programs, to address some of the concerns.

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**Hazardous threat** (left)  
Illegal hazardous waste dump site,  
Mojave National Preserve, California.



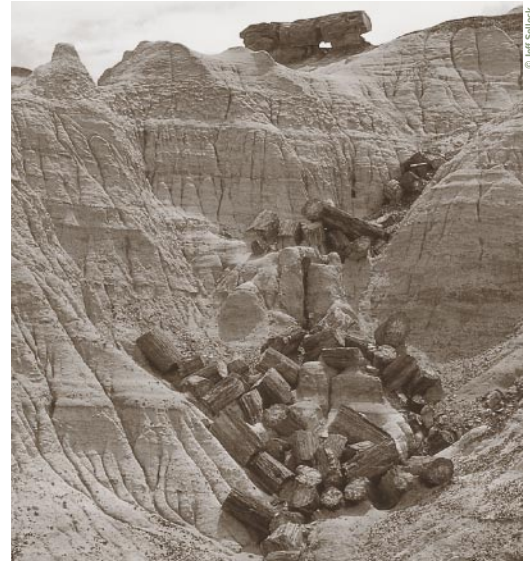


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**Air, water, and noise pollution** are natural resource threats posed by cruise ships that visit Glacier Bay National Park and Preserve in Alaska. Additional concerns are the number of ships visiting the park and possible interference with whale migrations.

Whether they originate inside or outside a park, natural resource threats are diverse and complex and no comprehensive inventory of them has been completed since 1980. While a list of threats is not particularly useful in and of itself, when combined with scientific information on the severity of impacts caused by various threats, the information is very important for resource preservation.

Data on some threats and the condition of park resources are being gathered through the national Inventory and Monitoring Program and other national park programs. This information is key to the process of planning resource management activities to prevent or mitigate threats, and must be gathered more extensively in the coming years. The National Park Service is making progress in this area, and would like to do more.



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**Theft of petrified wood** is a perennial problem at Petrified Forest National Park, Arizona.

## Demographics and resource preservation

by Glen Kaye

*"The world's most important arithmetic is the arithmetic of the exponential function."*

— Albert A. Bartlett, *Carrying Capacity Network*

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**T**he paradox is disturbing. Although ecologists recognize population dynamics as a core process of ecosystems, land managers and policy makers often fail to associate increases in human numbers with the health of parks. This thinking persists because the consequences of compound growth are so subtle, accumulating day by day by unnoticeable day. Moreover, many view America's population as unchanging. But America's population will continue to grow during the 21st century, and bring unprecedented pressures to U.S. parks and other public lands.

America's population is growing 0.8% per year. Thanks to compound growth, this seemingly innocuous growth rate will do what larger growth rates do; it will simply take a little longer. The U.S. Bureau of the Census (1996) projects that America's population will rise from today's population of 268 million to 335 million by 2025. Compound growth at this same rate will double America's population in 75 years to more than half a billion people.

Moreover, the population of the United States is not expected to stop growing, because, as the Bureau of the Census reports, the global human population is growing at 1.56% per year—equal to about 90 million people. Immigration to America will inexorably increase as people across the world respond to the laws of economics and seek better lives. In 1996, immigrants accounted for 46% of the annual increase of 2.3 million in U.S. population. During the next century, according to the United Nations Population Fund, 94% of the world's population increase will occur in developing countries. In addition, the Population Fund estimates about 23% of the world's people, almost all in the developing world, live in absolute poverty, a condition described by former World Bank President Robert McNamara, as "so limited by malnutrition, illiteracy, disease, squalid surroundings, high infant mortality, and low life expectancy as to be beneath any reasonable definition of human decency." For these people, migration will often be the only way to find a better life.

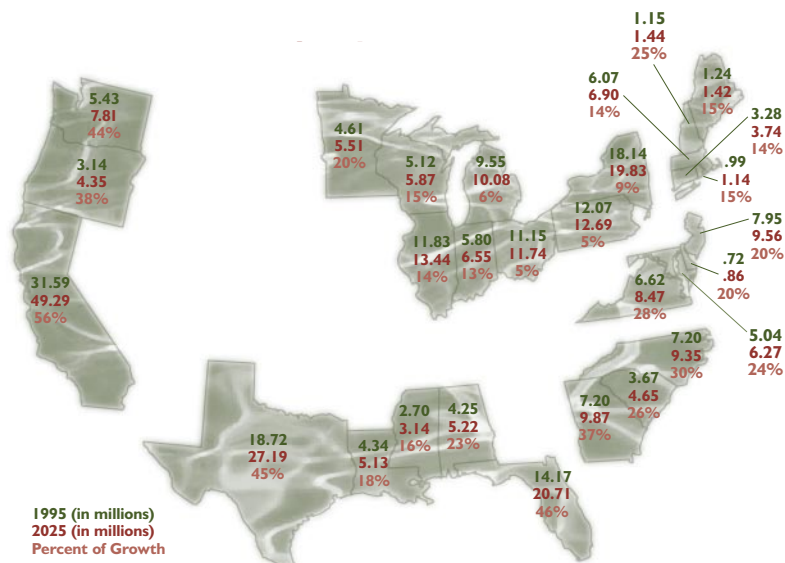
The pressure of population increases will be felt in every state, but most of all in the U.S. counties contiguous with coastlines, the Great Lakes, and the U.S.-Mexico border. For example, the population of U.S. counties and Mexican municipios along their international border increased by 830% between 1930 and 1990. According to demographers John R. Weeks and

Roberto Ham-Chande, this population of 9.34 million will double again in 22 years. The effects of people seeking to meet their basic needs in the arid Southwest are already conspicuous. The Río Grande below El Paso, Texas, is dry for most of each year. Due to continuing diversion from the Río Conchos watershed in Mexico, the Río Grande downstream in Big Bend National Park will likely become dry for part of each year.

Nearly half the U.S. population now lives within the 426 coastal counties, including the Great Lakes. Most of the population increase will come in these areas, where an estimated 1,000 acres of wetlands, the nurseries of the seas, are already being lost each day to development. Here and elsewhere, increased demand for minerals, water, fuel, fiber, and food will place unparalleled pressure on ecosystem functions.

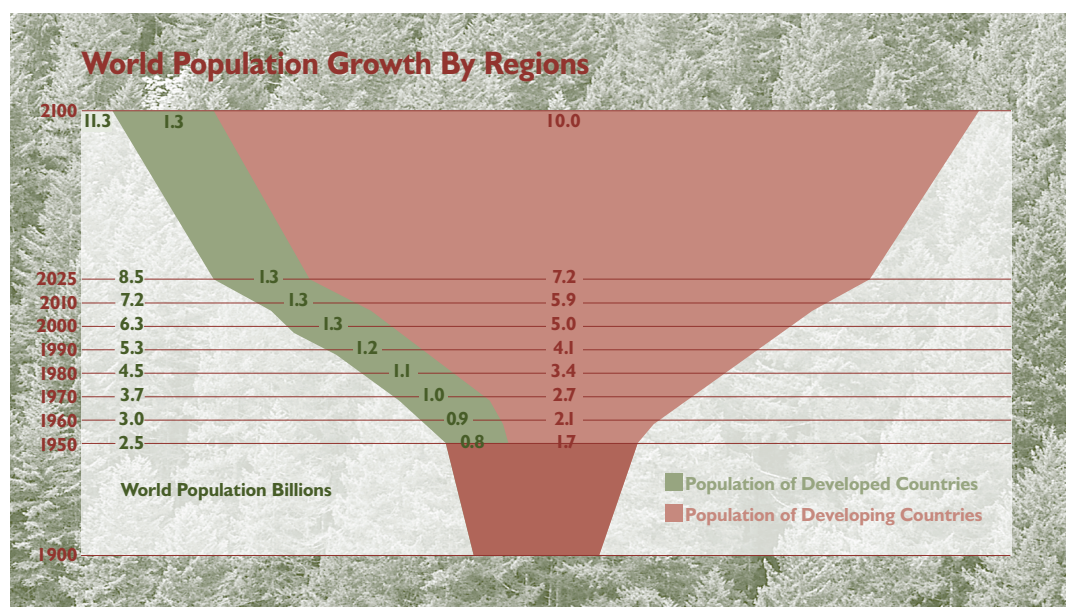
Non-point sources of pollution also continue to increase. The nearly parallel relationship between population increases and atmospheric carbon dioxide and methane levels will continue. In addition, direct exploitation of parks will increase as both immigrants and long-established citizens seek ways to make a living from park resources. Anything salable and easily harvested, plants, animals, fossils, or minerals, will suffer exploitation.

In a sustainable society, parks provide many things, including ecosystem maintenance, healthy recreational opportunities for people, laboratories where the fundamental workings of ecosystems are revealed, and



**U.S. coastal states population growth**  
Source: U.S. Census Bureau Data

places where our natural and cultural heritage is preserved and discovered. But the welfare of parks is ultimately linked to the basic needs of the people of the world. If national parks and monuments are to survive with any semblance of environmental quality and integrity, the National Park Service must nourish public understanding that a sustainable society is possible only if its population is stable. The concepts of population dynamics and consequences of population growth must be fundamental parts of our educational programs. But this effort must also articulate the need to create sustainable societies around the world. Without global sustainability, national sustainability or the sustainability of parks is impossible.



**World population growth**

## Internal threats Lake trout threaten native Yellowstone cutthroat

by Sue Consolo-Murphy

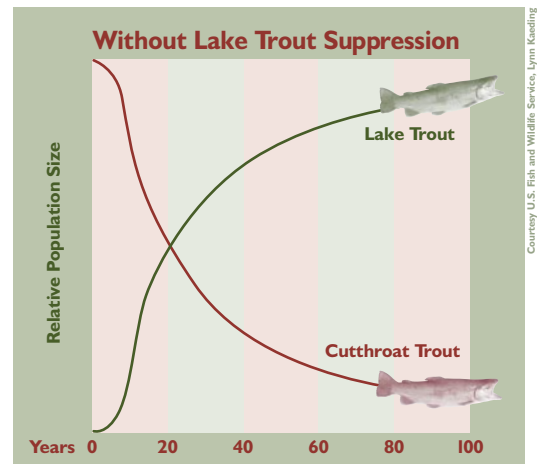
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In 1994, a visitor to Yellowstone National Park, Wyoming, caught a big, nonnative fish in Yellowstone Lake. Subsequent investigations confirmed the presence of a lake trout (*Salvelinus namaycush*) population, which poses a significant threat to native Yellowstone cutthroat trout (*Onchorynchus clarki bouvieri*) and to the associated food chain. The park's only native trout is already reduced to 10% of its original range as a species. At least 42 species—including threatened grizzly bears and bald eagles, ospreys, pelicans, otters, black bears, and numerous waterfowl—prey or scavenge on native trout, which spawn in small, shallow tributaries and frequent the surface waters of the deep lake. The larger, carnivorous lake trout live and spawn in deep waters, making them unavailable to most fish eaters, including anglers. A decline in the native fishery would also have serious negative consequences for the regional economy and recreational anglers.

Previous long-term monitoring—and most angling—efforts targeted only native trout, and thus failed to discover the lake trout invasion for at least two decades. Experts recommend “industrial-strength” gillnetting to control lake trout and new monitoring programs to evaluate control efforts. This requires additional staff

and equipment at a time of declining natural resource expenditures and, ironically, occurs just as the U.S. Fish and Wildlife Service (USFWS) closed its Fisheries Assistance Office, whose staff biologists had monitored and managed Yellowstone aquatic resources throughout the park's history.

In 1996, Yellowstone recruited a retired biologist, who volunteered as interim leader of fisheries management. One former USFWS biologist—enticed to change uniforms and stay with the park—traveled to the Great Lakes to learn about



**Left unchecked,** nonnative lake trout numbers in Yellowstone Lake would be expected to rise, to the detriment of native cutthroat trout.

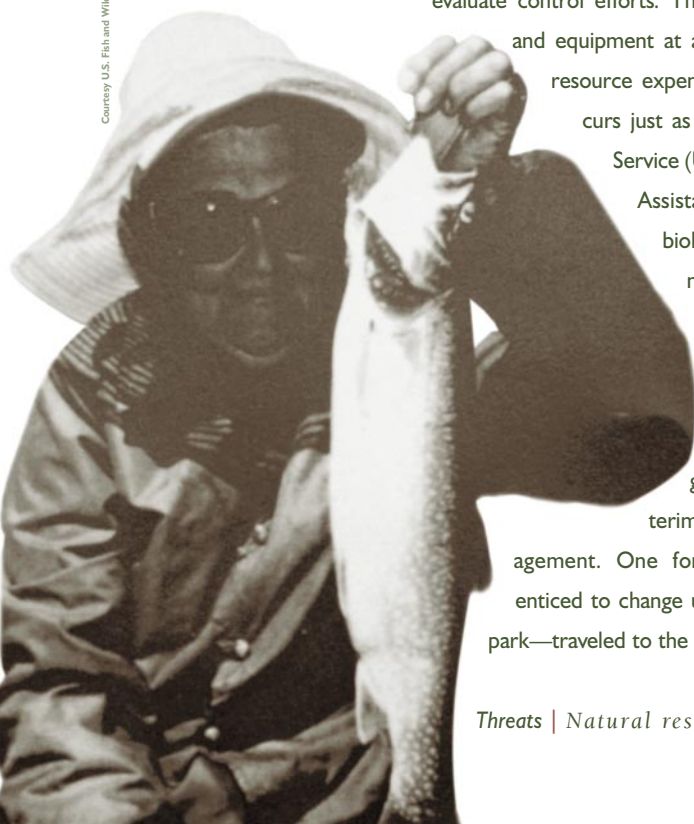


**Fisheries biologists** use gill nets to capture and control lake trout in Yellowstone Lake.

commercial gillnetting operations. According to lake trout experts, the good news is that our control efforts can be effective.

Last summer, biologists found a hotbed for lake trout spawning in the West Thumb of the lake. “Judas” fish were radio tagged and released so biologists can track them to gain information about how and where to control the invaders. That season, only two years after the discovery of the unwanted fish, 786 lake trout were caught by anglers and netting operations. The bad news is that the exotics, likely planted deliberately by some fan of “lakers,” may already number in the tens of thousands. Eradication is unlikely; long-term control is imperative to prevent the native Yellowstone cutthroat from becoming endangered.

**Surprise!** After reading a news story about the invasion of nonnative lake trout in Yellowstone Lake, a park visitor sent this photo of the lake trout she caught there.





## External threats

# The perennial push of exotic plants

by Gary Johnston

**N**onnative plants are everywhere in the national park system and new invaders arrive almost daily. More than 194 parks have recognized the threat they pose to natural resources, and these parks have identified more than 550 project statements in their resource management plans to address this serious problem. In attempting to manage the exotic invaders, the National Park Service spends about \$2 million annually. However, the unmet needs detailed in these project statements exceed \$20 million each year. Thus, the National Park Service is only able to provide one-tenth of the needed resources to address this threat.

Despite this shortfall, many parks are actively engaged in efforts to manage nonnative plants. Sharp-eyed employees at Big Bend and Redwood National Parks spotted Russian thistle (tumbleweed) and yellowstar thistle in loads of gravel and fill brought into the parks and removed these species before they could become established. Jewel Cave National Monument, South Dakota, worked with surrounding landowners and the U.S. Forest Service to introduce biological control agents for leafy spurge. Use of the agents will likely eliminate the use of herbicides above the cave, reducing possible contamination of cave resources. These lands will also serve as *insectaries* where the multiplying insects are distributed to surrounding landowners. In similar efforts, Devil's Tower National Monument, Wyoming, and Theodore Roosevelt National Park, North Dakota, have distributed hundreds of thousands of leafy spurge biocontrol agents to neighbors. Through education, many parks are also increasing the awareness of the problems caused by invasive plants and are publishing informational brochures, developing Internet pages, or creating calendars featuring exotics. Lake Mead National Recreation Area,



**Asiatic bittersweet**  
*Celastrus orbiculatus*



**A resource manager** sprays an herbicide to control the spreading exotic.

*invasive Nonnative Plants on National Park Service Lands* provides a blueprint for developing park-specific action plans for managing invasive plants. The plan emphasizes partnership activities and goals based on the principles of integrated pest management.

Going beyond the park focus, the National Park Service also worked with Department of the Interior and Department of Agriculture and other groups in 1996 to develop a national strategy for dealing with invasive plants. This strategy, called *Pulling Together A National Strategy for Invasive Plant Management*, is the first national model for addressing this significant threat to the nation's natural resources. More than 100 federal or state agencies or private groups have endorsed this strategy. However, the two strategies are only just beginning. Much work needs to be done to regain the lands from these invaders and to prevent new invasions from occurring.

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Nevada, and Great Smoky Mountains National Park, Tennessee and North Carolina, have developed exotic plant hit teams to assist other parks with management of these species.

An important development in 1996 was the completion of an exotic plants management plan for the National Park Service. *Preserving Our Natural Heritage: A Strategic Plan for Managing In-*

**Native to southern Europe and Asia,** musk thistle (*Carduus nutans*) is now widespread in the United States and Canada. It quickly colonizes disturbed areas such as roadsides.



## Communication breakdown over drilling near Lechuguilla Cave

by Pat O'Dell and Frank Deckert

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**Pipeline Profusion** Oil and gas pipelines crisscross the national park system. A 1996 survey turned up 244 of the lines in 55 parks.

Last summer, Yates Energy Corporation drilled an explorative well on federal land just north of Carlsbad Caverns National Park, New Mexico. The location was in a canyon tucked out of sight from all but a few backcountry park visitors. The operator failed to find indications of petroleum, plugged the well, and quietly moved along. So, why did this seemingly innocuous act culminate five years of environmental and technical scrutiny, a strange mix of industry posturing and partnership, intense public involvement, a new federal law, and a lawsuit?

The controversy centered around drilling oil and gas wells into the same karst system that houses the Lechuguilla Cave, a world-renowned cave with exceptional formations unknown anywhere in the Western Hemisphere. To many, the proposal seemed to trivialize the very resources Carlsbad Caverns was created to preserve. Concerns focused on the operator's inability to ensure that drilling fluids, brine,

hydrocarbons, or poisonous gases would not contaminate the cave-forming strata.

The National Park Service had no permitting authority for the well, but cooperated with the Bureau of Land Management (BLM) to develop the Dark Canyon Environmental Impact Statement (EIS). Three years in the making, the EIS exemplified cooperation among government agencies, the environmental community, and the oil and gas industry. The record of decision was touted as one based on sound science. It established a no drilling "cave protection zone" and set strict drilling and production criteria aimed at cave protection where drilling would be permitted. Additionally, strong public involvement moved Congress to pass the Lechuguilla Cave Protection Act of 1993. The law withdraws lands in the cave protection zone from future mineral leasing and prohibits new drilling on existing leases. Lechuguilla was safe . . . or so it seemed.

After the law was passed, Yates Energy Corporation promptly sued the Bureau of Land Management claiming the cave protection zone and drilling restrictions amounted to a *takings* of their minerals, but the case never got to court. The bureau, independent of the National Park Service, agreed to settle. Settlement terms allowed drilling the well just outside the protection zone under standard lease terms. The special cave protection measures developed in the Dark Canyon EIS seemed to have been lost in the shuffle. The National Park Service again drew on its cave resource management and oil and gas expertise, and urged the strictest "standard" drilling stipulations to be reinstituted as cave protection measures. Though less restrictive than the EIS requirements, the measures provided the bulk of the intended EIS protections.

We did not expect that a breakdown in communication would occur so near the end of a project that was showcased for its collaborative efforts. Since BLM personnel were advised not to discuss the suit with outside parties, it may have been better if the National Park Service had been named in the lawsuit. Interagency cooperation would likely have been maintained, removing the need for last minute solutions.

When resources are threatened by activities outside a park, and even thousands of feet underground, effective communication with neighbors and supporters is paramount. In many instances, we will have to invite ourselves in the door.



Geologic Resources Division

The drilling rig was located 1½ miles from known passages of the world-renowned Lechuguilla Cave. Still, cave protection experts were concerned that the regional geology could potentially allow leakage from the well to flow into the cave.

## Historic water rights settlement averts threats at Zion

by Dan McGlothlin and Bill Hansen

**T**he East and North Forks of the Virgin River, the Weeping Rock, and other beloved water resources in Zion National Park are forever protected following five years of negotiation that culminated in a historic settlement in December 1996. Secretary Babbitt, Governor Leavitt, Zion Superintendent Falvey, and representatives from Washington and Kane Counties, Utah, signed an agreement for Zion recognizing the first federal reserved water right for a national park in Utah. Negotiators reached the settlement by avoiding common state and federal government rivalries and using scientific data to solve complex water rights issues. The agreement secures water rights to protect instream flows and groundwater in the park and provides a dependable water supply for local communities.

The NPS Water Resources Division initiated studies in 1987 to support water rights claims in the Virgin River Adjudication and to address the threat of proposed upstream dams. The studies estimated the amount of water necessary to support park purposes and maintain water resources in an unimpaired condition. Investigations included water and sediment discharge, age and origin of groundwater, channel-forming processes, riparian vegetation, native fisheries, aquatic organisms, hanging gardens, aesthetics, and recreational use. In 1992, the Park Service and attorneys from both the Interior and Justice departments reopened negotiations to quantify water rights for the park. The following year, a technical workshop helped to educate state and Washington County Water Conservancy District staff about NPS entitlement to and need for water rights at the park.

Equipped with a new understanding about the dependence of water-related resources on stream flows and groundwater in the park, the parties formed a technical team to develop and evaluate settlement proposals. All of the proposals offered park protection and state flexibility to develop a limited future amount of water. The team asked noted scientists to evaluate impacts of

current and future water development on flow regimes and water-related resource attributes in the park.

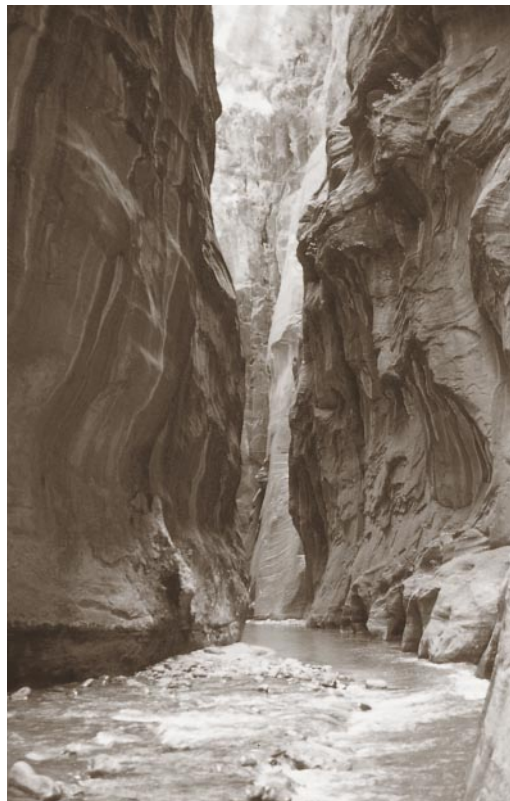
The final agreement recognizes a federal reserved water right to all the unappropriated flows in and above the park and allows valid existing uses to continue. It subordinates to a small amount of water development above the park and limits total depletion. It prohibits the construction of proposed dams on the East and North Fork of the Virgin River and a transbasin diversion to Cedar City. It also specifies diversion limits and periods, bypass flows, and groundwater protection zones. We doubt whether the National Park Service could have secured this impressive set of protections through litigation.

The historic agreement will need to be confirmed by the adjudication court before water rights are decreed. Should objections arise, Utah and Washington and Kane Counties have agreed to stand “shoulder-to-shoulder” with the Park Service in support of the settlement.

At the signing ceremony, the secretary and the governor encouraged the continued use of “good science” and cooperative efforts to solve complex water rights issues in Utah. This agreement establishes a process that can be used to complete settlements of this nature at other Utah parks.

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**Canyon-forming water flows** will continue to help preserve park features such as the Narrows under the recent water rights settlement at Zion National Park.